The Self as a Complex System

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Abstract - This text introduces the metaphor of complexity to account for psychic life. The self is treated as an agency emergent from complexity, possessing its characteristic properties : sensitivity to initial conditions, singularity, historicity, and holistic integration.

Keywords : Psychoanalysis ; Complexity ; Dynamical system ; Self

Translated from the French original, "Le soi comme système complexe" (www.benoitvirole.fr)

Introduction

From the last months of pregnancy onward, the fetus's orientation toward differentiated objects is a well-attested fact[1]. Certain early cognitive competencies of the infant are, admittedly, sometimes overestimated — a baby of only a few days old is not really capable of reasoning or of counting ! In any case, the precocity of cognitive activity is a certainty[2]. What is at stake is not merely a preferential recognition of the mother's voice, but a selective orientation toward physical stimuli bearing no direct relation to the mother. This behavior cannot be reduced either to an imperious attraction toward light or noise, or to a simple reflex. Selective orientation is a cognitive operation ; it implies a choice among several alternatives, and this choice depends on an early self-awareness. At birth, the infant is thus aware of itself, aware of the existence of the other, and aware of a third object. This early intersubjectivity undermines the notion of an initial state in which the child would exist in a psychic fusion with its mother. As D. Stern puts it : "The emergent sense of self appears from birth. Infants are pre-programmed to be aware of self-organizing processes. They never go through a period of total self/other undifferentiation. There is never confusion between self and other at the beginning of, or during, early infancy. They are pre-programmed to respond selectively to external social events, and they never experience an autistic phase."[3]

The initial phase devoid of self-awareness postulated by psychoanalysis, and formulated under various names — primary narcissism (Freud), normal primary autism (Mahler), the anobjectal phase (Spitz) — is thus refuted. Innate intersubjectivity, however, does not resolve every difficulty. When, exactly, does it begin ? Birth is a major event, certainly, but it is not the inaugural moment of consciousness — consciousness already exists during intrauterine life. How, then,

can we date its appearance without straying into philosophical or religious speculation ?[4]

Another problem concerns compatibility with clinical data. Autistic withdrawal secondary to early trauma is an observable reality. Our own clinical practice as a psychologist in a pediatric department allowed us to observe children presenting autistic-like clinical pictures following ruptures of attachment, pain, or the loss of sensory functions. With psychotherapeutic support, many of these children were able to re-establish themselves on a normalized developmental trajectory. How are we to understand this fact if we no longer have available the concept of a primary autistic phase serving to protect the child against trauma ? Finally, the pure and simple abandonment of primary narcissism is not without its costs. Abandoning the term itself is admittedly beneficial — it suggested the existence of a specular love (Narcissus contemplating his image reflected in the water), whereas the image of the self is in fact acquired only later in the child's development. But abandoning the concept altogether carries a theoretical cost[5]. How, otherwise, are we to understand the pursuit of narcissistic states observed throughout psychic life — in religious belief (paradise), in artistic creation (another world), in experiences of intoxication (absolute jouissance), and in certain lived experiences of the analytic patient ?[6] Abandoning primary narcissism — an experience of absolute quietude — leaves us disarmed in the face of the facts of analytic experience. We are thus confronted with a contradiction : we cannot abandon primary narcissism, and we cannot set aside early intersubjective relations either.

Toward an Alternative Conception

We must turn to alternative conceptions. Between the existence of a unified self capable of reflexive consciousness, and total fusional undifferentiation, there lies a third way : progressive constitution through the agglomeration of nuclei. The idea of an ego constructed through the synthesis of nuclei is not new ; it is present in the work of Glover[7]. Bernard Golse has proposed the idea of a progressive aggregation of nuclei of intersubjectivity. In the course of maturation, nuclei of the self emerge from sensory experience, allowing for a partial reflexive consciousness. These come together to form a complete intersubjective relation at certain moments of the infant's life — particularly during breastfeeding and in cooperative behaviors. As Golse writes :

Access to intersubjectivity is not an all-or-nothing affair, but unfolds dynamically between moments of primary intersubjectivity that are genuinely possible from the outset, though fleeting, and probable moments of non-differentiation. Access to intersubjectivity would then correspond to a movement of progressive confluence and convergence of these nuclei of primary intersubjectivity. The work of R. Roussillon points in the same direction, indicating that the first other can only be a specular other — sufficiently similar to, and yet slightly different from, the self[8].

During these moments, the infant unifies the separate nuclei of the self through an intermodal sensory experience, in which the mother's voice, her scent, her face, and the taste of her milk come together into a single unified object. The experience of sensory intermodality allows for the cohesion of a unified self and the constitution of a relation to the mother. But this cohesion is momentary : the self fragments once again until the next experience of cohesion occurs. Over the course of development, this cohesion lasts progressively longer, until it becomes permanent. This thesis allows us to reconcile the existence of apparently "autistic" states with the observed

fact of early object construction. It accounts for the sensory dismantling observable in pathological forms of autism, and it also accounts remarkably well for clinical data concerning sensory impairments. In cases of sudden-onset deafness, we observe disorganizations of the self ; conversely, cochlear implantation — by creating new auditory sensations — can produce narcissistic reorganizations[9]. According to Bernard Golse, this thesis also allows us to understand certain aspects of romantic love, viewed as a reactualization of the mother-infant relation. When one of the lovers experiences a total object relation, the other is perceived as distinct from the self — just as a child perceives its mother as desirable yet distinct. The partner, conversely, perceives the beloved within a fusional relation, comparable to the experience lived by the mother breastfeeding her child. We cannot fully meet one another in love, because we cannot exist in a state of instantaneous reciprocity — we remain bound to intersubjective asymmetry. When one partner perceives the other as separate from the self, the other perceives the first as constitutive of the self[10].

This thesis of the progressive cohesion of nuclei of the self is appealing, and compatible with clinical observation. It does not, however, answer the question of the emergence of a reflexive self-consciousness arising from sensory experience. Why should the perception of an object entail the birth of a feeling of selfhood ?

Precurrence and the Neurobiological Basis of Reflexivity

In 1906, Sherrington attributed crucial importance to the following observation : across evolutionary lineages, the development of the encephalon is always achieved from the primary cortical areas onto which the afferents of the sensory organs project — most notably those of smell, vision, and hearing, which enable perception at a distance[11]. For Sherrington, distal perception drives an evolutionary dynamic, because it imposes a delay — a *precurrence* — between the detection of an object and knowledge of it. By its very nature, all distal perception is reflexive cognition : perceiving a distant object requires reflection upon its existence, and thereby the emergence of self-consciousness. Precurrence induces a cognitive space distinct from reflex reactions, one that entails an anticipatory representation favoring decision-making. As Sherrington writes :

Food, sexual consummation, suitable posture, preservation from injury, are ends to whose direction the reactions from the distance-receptors are, equally with the longer series of actions due to projicient receptors reacting to objects at a wider horizon, subservient. It is rather that the latter afford a freer field for the winning of more subtle adjustments with wider application of associative memory[12].

This precurrence is a natural phenomenon. The human infant shares it with other mammals endowed with perceptual capacities and a certain degree of encephalization. There is, however, a specifically human feature. The human infant is born with a full trimester of missing neuronal maturation. Early electrophysiological investigation (auditory and visual evoked potentials) and assessments of newborn sensory capacities attest to the incompleteness of the neuronal structures required for a unified perceptual construction. In keeping with the literature on early competencies, fine-grained detection of stimuli and early categorization abilities do indeed exist — but inconsistency is the rule. States of alertness, and the newborn's psychic and somatic states, modulate perceptual performance, which is often non-reproducible. So-called "objective" electro-

physiology, and the recording of physical signals, yield only partial — and sometimes doubtful — results, and tell us nothing about how these signals are actually put to perceptual use. The sensory receptors are certainly functional ; the ascending auditory pathways, though still undergoing myelination and thus imposing certain latencies, do transmit a signal. But the cognitive structure capable of integrating these signals is not always available. The reflexive nuclei arising from distinct perceptual experiences are not yet integrated into an intermodal perception constitutive of the experience of an object, and thus of a unified reflexive self.

The perceptual construction that allows for the emergence of a unified self requires, beyond neuronal maturation, the assistance provided by the mother — a partner who compensates for the infant's prematurity. The integration of the nuclei of the self is achieved through the mother's psychic labor, which lends cohesion to the fragmented experiences of her infant's self. This psychic labor is neither an operative action nor a communicative statement — the term *reverie* is best suited to describe the flow of thoughts, phantasies, and feelings of pleasure that occur in the mother in contact with her infant. Any affective disturbance in the mother that impedes this mental activity, or that turns it into a merely operative process, has a negative repercussion on the integration of the child's self. Numerous observations drawn from attachment psychology, from the psychoanalysis of early relations, and from the analysis of adult transference, confirm the importance of this maternal function[13].

Toward a Model

With this notion of the progressive integration of the nuclei of the self, we arrive at a coherent conception that integrates clinical data alongside contributions from biology, developmental psychology, and psychoanalysis. To achieve full consensus, this conception will require further refinement, elaboration, and nuance — but its essential outline is established. The feeling of selfhood is constructed through the integration of nuclei. There exists, in the infant, a normal dynamic of fusion and separation among these nuclei. These nuclei are bound to perceptual experience ; precurrence is the source of their reflexivity ; and their integration into a unified self depends on the contribution of the mother, or of an adult partner assuming the task of compensating for prematurity.

Certain points, however, remain unresolved. How, concretely, does the emergence of a unified self out of fragmented nuclei come about ? Is the self a module, a psychic agency ? Should it be reified, or used merely as an abstraction ? Should it be granted the status of a mental state, or of a higher-order function ? Can it be assigned neuronal correlates, an anatomical localization ? All of these questions remain open. They overlap, in part, with the questions surrounding consciousness itself. Numerous investigations in neurobiology, cognitive science, and psychopathology are today attempting to answer them. We wish to contribute to this collective effort by drawing on complexity science.

Complexity science has been applied across numerous domains, from meteorology to economics, by way of immunology, hydrology, and the physics of turbulence[14]. Any domain whatsoever can be made the object of an analysis in terms of complex systems — by definition, such an analysis is independent of the nature of the underlying substrate. Psychic development can therefore be approached through complexity. It is treated as a dynamical system endowed with properties of self-organization, immersed within a physical environment and subject to the effects

of other complex systems. This is not a gratuitous metaphor : there exist remarkable structural identities among dynamical systems, the neuronal space, and psychic development. The analogy is also justified methodologically. We seek to account for a phenomenon — the emergence of the self — and no approach that helps render it more intelligible should be rejected a priori.

We treat psychic development as a complex dynamical system endowed with self-organizing properties. Every such system must maintain itself within its environment by delimiting, through interfaces, its exchanges with that environment. It differentiates itself from the environment and can influence it through its own action. It self-regulates by coordinating these exchanges. In carrying out these coordinations through regulatory feedback loops, the system is led to sequence its information-processing operations and to store part of that information. It is thereby compelled to acquire memorial capacities and to create agencies capable of carrying out processing and sub-processing operations. The ultimate evolution of a system endowed with self-organizing properties is the generation of a higher-level agency capable of anticipation and of self-awareness. This agency allows the system to self-finalize. Self-organization theory holds that a system driven by the need to maintain its own homeostasis develops cognitive levels of increasing hierarchy, up to and including the establishment of an ultimate agency capable of self-observation[15].

The analogy with the emergence of the self is suggestive. It is reinforced by the properties of complexity, which apply, point for point, to psychic life. Every system that emerges from complexity depends on its initial conditions, and its responses integrate the history of its own development. The emergent agency is delocalized across the full set of interactions among the elements of its substrate. It is irreducible to the physical properties of the system's constitutive elements — in this case, the neurons. It possesses new qualitative properties that cannot be deduced from the properties of the underlying system. It exerts downward causation upon the underlying systems of lesser complexity. The holistic agency — the whole — exerts a constraining influence upon its parts. It is capable of integrating, in an unprecedented form, elements drawn from subordinate levels. It is unpredictable : from outside the system, we cannot predict its behavior with certainty, even if we know the exact values of the full set of its parameters. Under environmental pressure, the dynamical system creates topological singularities, which become the indices of the symbolic categories processed by the emergent agency[16]. Finally, such emergent systems can degrade in complexity and stabilize at simpler organizational plateaus.

If we reinterpret these properties by attributing them to the self, we obtain remarkable correspondences. The self is singular : it is demarcated from its environment and maintains this demarcation under a constant threat of degradation. It is cohesive, and exercises downward causation over the substructures subordinate to it. The self also assumes responsibility for the cohesion of cognitive functions, the virtualization of its possibilities for self-realization, and its own individuation. It performs information in an unprecedented form, one not deducible from its underlying sources. It is thus endowed with generative properties, and can virtualize its own becoming. Finally, its cohesion can be broken : it can disintegrate and re-establish itself at earlier developmental positions.

We thus arrive at a model — some will call it a metaphor — that renders the self more intelligible and allows us to advance in its study[17]. But this model has a flaw. To maintain a complex

system in a state capable of evolving toward the emergence of an agency endowed with reflexive consciousness, it must be sustained energetically. To take an illustration : Earth's climate, a complex system, unfolds the whole set of its apparent morphologies because it is sustained by solar radiation. Should that radiation disappear, the entire climate system — to say nothing of life on Earth — would undergo a definitive, irreversible collapse. It is precisely on this point that psychoanalysis, which we had shown out the door, returns through the window. The emergence of the self cannot be sustained without a constant energetic input. Narcissistic love — the love we bear toward ourselves — is necessary for the maintenance of the self.

The Contribution of Psychoanalytic Research on Narcissism

The contribution of psychoanalytic research on narcissism is therefore fundamental. Our conception of the self owes much to the foundational contributions of Béla Grunberger and Heinz Kohut. The self is a psychic agency emergent from narcissistic recursivity. Attributing this agential status to the self in no way diminishes the importance of the other psychic agencies discovered by psychoanalysis. Extending Freud's own metaphor for the relations among the psychic agencies, we might say that the ego — the agency of conscious intentionality, attempting to give meaning to the drives of an untamed mount (the unconscious) and to the injunctions of the superego — must also contend with the pull exerted upon it by the self. A rereading of psychopathology along these lines then becomes possible.

Toward Culture

Recognizing the self as an agency emergent from complexity opens perspectives for the exploration of culture. The self, by its very nature, depends upon the anticipation of its own realization — it is permanently virtualizing itself. The analysis of the self thus invites us to elevate the place of fiction within the order of psychological values. The creation of fictional worlds lies at the very heart of our culture. We need stories as much as we need oxygen and love. We can only be ourselves by imagining ourselves as other — for at the dawn of our lives, we were dreamed into being by another.

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Notes

[1] : Lecanuet, J. P., & Schaal, B. (2002). "Sensory Performances in the Human Fetus : A Brief Summary of Research." *Intellectica*, 34(1), 29–57.

[2] : Wynn, K. (1992). "Addition and Subtraction by Human Infants." *Nature*, 358, 749–750.

[3] : Stern, D. *Le monde interpersonnel du nourrisson*, 1985, PUF, 1989, p. 89.

[4] : Eccles, J. C. *Évolution du cerveau et création de la conscience*, 1989, Fayard, 1992.

[5] : Smadja, C. : "Primary narcissism is a theoretical presupposition indispensable to the coherence of the Freudian conception of the child's drive-based life. It represents the state toward which secondary narcissistic cathexes make their return, particularly in the course of processes of desexualization." *La vie opératoire, Études psychanalytiques*, PUF, 2001, p. 91.

[6] : Grunberger, B. *Le narcissisme, essai de psychanalyse*, 1971, Payot, 1993.

[7] : Glover, E. "The Relation of Perversion Formation to the Development of the Reality Sense." *International Journal of Psychoanalysis*, XIX, 1933. Referenced in Fenichel, O. *La théorie psychanalytique des névroses*, 1945, Vol. 1, PUF, 1953.

[8] : Golse, B. *Revue belge de psychanalyse*, No. 55, Autumn 2009, pp. 41–56. See also Roussillon, R. *Paradoxes et situations limites de la psychanalyse*. Paris : PUF, 2001.

[9] : Virole, B. *Surdité et sciences humaines*, L'Harmattan, 2009. Cochlear implants — digital systems interfaced with the neuronal space — artificially generate auditory perceptions. The controlling factor is the narcissistic cohesion of the self, required for the assimilation of these new perceptions.

[10] : Summary based on the author's notes from a lecture given by Bernard Golse at the IRSA in Brussels, 2010.

[11] : Sherrington, C. *The Integrative Action of the Nervous System*, 1906, Cambridge, 1952.

[12] : Sherrington, C. *The Integrative Action of the Nervous System*, 1906, Cambridge, 1952, p. 332.

[13] : Described in many forms, by attachment psychologists and ethologists alike as by psychoanalysts (maternal reverie ; the alpha function in W. Bion).

[14] : For an introductory synthesis of the contributions of complexity science to the human sciences, see Mainzer, K. *Thinking in Complexity : The Complex Dynamics of Matter, Mind, and Mankind*. Springer, 1994.

[15] : Le Moigne, J.-L. *La modélisation des systèmes complexes*, Paris, Dunod, 1990 ; and, for an analysis of the contribution of self-organization to psychopathology, Virole, B. *Sciences cognitives et psychanalyse*, P.U.N., 1995. [16] : On all these aspects, we can only refer the reader to the literature on artificial life, in particular the journal *Artificial Life* (Langton, C. G., Ed., Addison-Wesley Publishing Company), as well as, more recently, Hordijk, W. S., Kauffman, S. A., & Steel, M., "Required Levels of Catalysis for Emergence of Autocatalytic Sets in Chemical Reaction Systems," *International Jour-*

nal of Molecular Sciences, 2011, and the excellent French journal *Intellectica*, in particular its special issue "Emergence and Explanation," 1997, No. 25.

[17] : Methodologically, metaphors are necessary. They sketch out virtual spaces within which the objects of study can be immersed, allowing us to observe their propagation and thereby to deduce their properties. This is the great epistemological lesson we owe to René Thom.

Translator's note : This is a scientific English translation of the French original by Benoît Virole. Direct quotations originally given in English in the source text (Stern, Sherrington) have been restored to their original English wording rather than back-translated from the French ; all other quoted material (Golse, Smadja) has been freshly translated from the French. Key terms follow established English usage in psychoanalysis (primary narcissism, specular, reverie, the alpha function) and in complexity/self-organization theory (emergent agency, downward causation, topological singularity).